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THE IMPACT OF ICT ON QUALITY OF LIFE

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Abstract

The Malaysian government invested hugely on Multimedia Super Corridor (MSC) as a global hub in its endeavor to provide the best environment to harness the full potential of multimedia as a new way of living, working, and playing in the new information era. This cross-sectional study investigates the implication of ICT on the Quality of Life (QoL) among rural communities where perceived usefulness, perceived ease of use, user satisfaction, were hypothesized to influence QoL. Using self-administered questionnaire survey, the study indicated that the rural communities are exposed and aware about the importance of ICT in their daily activities regardless of their age. Hence, the government's effort can thus be considered fruitful in bridging digital divide among the communities in order to improve their QoL. The study suggested perceived usefulness and perceived ease of use are important factors affecting user satisfaction with the latter acting as a mediator on QoL.

Keywords: ICT, QoL, Perceive Usefulness, Perceive Ease of Use, User Satisfaction

Topic Groups: Technology and innovation management

INTRODUCTION

ICT is strongly believed to play a vital role in national development (Sein & Harindranath, 2004) resulting in most governments in developed and developing countries having made significant investments in ICT involvement. As a catalyst for national integration, ICT enables spurring of wide access to health and education services is seen as a key driver to create economic opportunities for underprivileged groups, (Mercer, 2001; Reisman et al., 2001; The World Bank, 2001; UNDP, 2001; Oberski, 2004; Jensen 2007) as part of a dynamic agent of change towards better economic and social changes (Avgerou, 1998; Morales-Gomez & Melesse, 1998). Due to the above, the Malaysian government allocated a substantial fund of US$800m yearly in specific loans and guarantees on ICT development and projects (World Bank, 2009) with a total expenditure reaching almost RM10billion (USD 3.1billion) in 2013, as announced by the Ministry of Science, Technology and Innovation (MOSTI).

Schalock (2004) highlighted that one of the scientific innovations towards Quality of life (QoL) is having knowledge driven society which accounts for a variety of ICT utilizations. Hence, governments in developing and developed countries have given strong focus on bridging digital divide by increasing availability and access to ICT for communities to benefit from ICT in terms of improved QoL, as it is generally agreed that ICT leads to development (Heeks, 2010) and the people in rural communities in developing countries are seen not to have realized this benefit (Silva & Figueroa, 2002). In contrast, ICT has on certain occasions found neither relevant to the social, economic and cultural needs of the rural communities nor intended beneficiaries (Kivunike et al., 2008).

The Malaysian government set priority to the development of ICT in preparing the country towards a developed nation in Vision 2020 with the launching of the Multimedia Super Corridor (MSC) in 1996 with the objective to establish a strong fundamental of ICT infrastructure with the mission to transform Malaysia to a developed and information-rich society. Until September 2013, the Economic Planning Unit (EPU) reported a total of 2175 tele-centres have been setup by the Malaysian Government via various agencies.

In 2010 ICT Census, the gap of digital divide among the rural and urban population in Malaysia was 26.1 percent. The World Bank Search Review reported that Malaysia has shown positive trend in the usage of Internet from 20 per 100 in 2000 to 66 per 100 in 2012. Digital divide is regarded as the socioeconomic disparity among those people who have and do not have opportunities and skills in ICT which enable them to benefit from digital resources, especially the Internet. Hilbert (2010) has identified educational attainment as the most significant explanatory variable for ICT access and usage, noting that people living in urban areas have more access and usage of ICT.

Many research and studies on ICT focused on the effect of industrial development conducted at the macro level (Adam & Wood; 1999) but less focusing on the impact at the micro level (Ashraf et al., 2007; Dwivedi et al., 2007; Choudrie & Dwivedi, 2007). This paper discusses the socio-economic effects of ICT on selected samples of the population for the need to understand the socioeconomic influences, including the benefit of usage at the community level. It issuggested that the ICT impact occurs when there are changes or influence and whether that influence is positive to the community or recipient while using ICT.

Ideally, the Malaysian government has been aggressive in promoting and facilitating ICT to the society. As a result, Malaysian preparedness or e-readiness level is marked as amongst the highest in the ASEAN countries (Bui et al., 2002). This paper explores the need to discover the society's readiness to adapt this technology by understanding the impact on rural communities. Hence, this study is conducted to address the following objectives:

1. To identify the relationship of Perceived of Usefulness (PU) and Perceived Ease of Use (PEU) of using ICT facilities on User Satisfaction (US) among rural communities;
2. To determine the relationship between user satisfaction (US) of using ICT and the quality of life (QoL) among rural communities; and
3. To examine the moderating effect of usage frequency (UF) on the relationship between user satisfaction (US) and quality of life (QoL) among rural communities.

THEORY AND LITERATURE REVIEW

Davis et al.'s (1989) Technology Acceptance Model (TAM) that emphasizes perceived usefulness as the major motivating factor in the use of computer technology and Theory of Reasoned Action (TAR) by Fishbein & Ajzen (1975) suggests that a person's behaviour (in this case user satisfaction) is determined as a function of one's attitude towards the behavior and his/her subjective norm (perceived usefulness and perceived ease of use) are used as the basis of this study. If a person perceives the outcome from performing a behavior is positive, he/she will have a positive attitude performing that behavior or vice versa. A set of predictors was identified as the factors of QoL in congruent to Kivunike et al. (2008), suggesting the level of ICT use, ICT skill, perceived cost and benefit of ICT, ICT implementation policy framework and user acceptance as vital factors that determine the nature and magnitude by which ICT contributes to QoL. They emphasized the above factors are not entirely independent but inter-related to each other to foster better ICT implementation. Thus, this paper suggested the determinants of QoL comprising perceived usefulness (PU) and perceived ease of use (PEU) with user satisfaction (US) serves as a mediator and usage frequency as the moderating variable. The definition and operational definition of each construct used in the paper shall be discussed next.

Quality of Life

Over the past decade, ICT has innovated the way people play, learn and communicate. It keeps changing our lifestyle and it is obvious that ICT affects our daily routine with the torrent of information available on hundreds of millions of sites crowding every second, besides its ability to keep people constantly in touch with each other via electronic mail and voices (Henderson, 2001; Leung & Lee, 2005). This creates a megatrend along the line of the printing press, telephone, computer and electricity, as ICT is said to just about taken over peoples' lives (Leung & Lee, 2005).

QoL definition of Wei & Leung (1998) is adopted in this study where it is defined as the subjective perception of satisfaction with family life, leisure and friendship. This definition reflects the general evaluation of one's living quality. QoL becomes a major concern for individual and communities seeking to find sustainable life satisfaction in a technologically changing world (Mercer, 1994; Leung & Lee 2005). Accordingly, Anderson & Tracey (2001) also noted that globalization and rapid advances in ICT offer us vast unprecedented opportunity to improve life quality. Thus in this paper, QoL is accessed through leisure and

amount of non-workactivity. Using 3 main dimensions; Social Economic Status, Contribution from Self-Actualization and Social Relationship, QoL is measured by 15 items.

Perceived Usefulness (PU)

According to Venkatesh et al, (2003) and Davis (1993 and 1989), PU is defined as "the degree to which a person believes using a particular system", ICT in this context would enhance his or her job performance. As enhanced by Hong & Tam (2006), PU is categorised as extrinsic motivation that determines the level of system or technology which is providing benefit in performing certain activities. Through using ICT, it is expected that the users gain benefit that enhance their routine due to derivation value from technological usage (Bhattacherjee & Sanford, 2006; Karahanna et al., 2006) and increase efficiency in daily activities (Singh et al. 2010). In this context, rural communities could save more time and cost in their daily routine such as paying bills, effective communication, information access and etc. at their fingertips. Thus it is proposed that

H1 : There is a positive relationship between perceived usefulness (PU) of using ICT facilities on user satisfaction among rural communities.

Perceived Ease of Use (PEU)

In Technology Acceptance Model (TAM), one of the core determinants of system or ICT usage is PEU if only user believes usage of a system or technology to be easy (Venkatesh et al., 2003, Davis 1993, 1989) by considering that acting upon the activity of interest relatively involve zero cost and free of cognitive burden. The 'easiness' to become skilful in mastering certain technology may influence user attitude towards satisfaction. The easier the use of system or technology, the greater the chance of being effortless, and this eventually turned into efficiency. In accordance, Hu et al., (2011), Malhotra et al., (2008), and Hsieh et al., (2008) ascertained that easiness can derive skilfulness in mastering certain technology and will shape their user attitude towards satisfaction. Thus, it is hypothesised that

H2 : There is a positive relationship between perceived ease of use (PEU) of using ICT facilities on user satisfaction among rural communities.

User Satisfaction

User satisfaction has various definitions depending on the scope of the research. In IS research, user satisfaction is an understanding of the system and success (Baroudi & Orlikowski, 1988) or user believes about the relative value of IT (Swanson, 1974). Perceived product or service performance is a direct result of evaluation of product or service attributes during the actual consumption experience. Generally, the user or customer will be satisfied when the products or services performance are favourable and dissatisfied when the products or services are unfavourable. Melone (1990) acknowledged that most of researchers and practitioners choose user satisfaction as mediating variable to measure user attitude about the system, evaluate IS, IT, ICT effectiveness and predicting user behaviour (Ives & Olson, 1984, Delone & Mclean, 1992). A Taiwan study by Liang and Yang (2010) found a positive relationship between user satisfaction and QoL which were later verified in Ling et. al, (2012) study. Hence we also proposed that

H3 : There is a positive effect of user satisfaction (US) on quality of life (QoL) among rural communities.

Usage Frequency (UF)

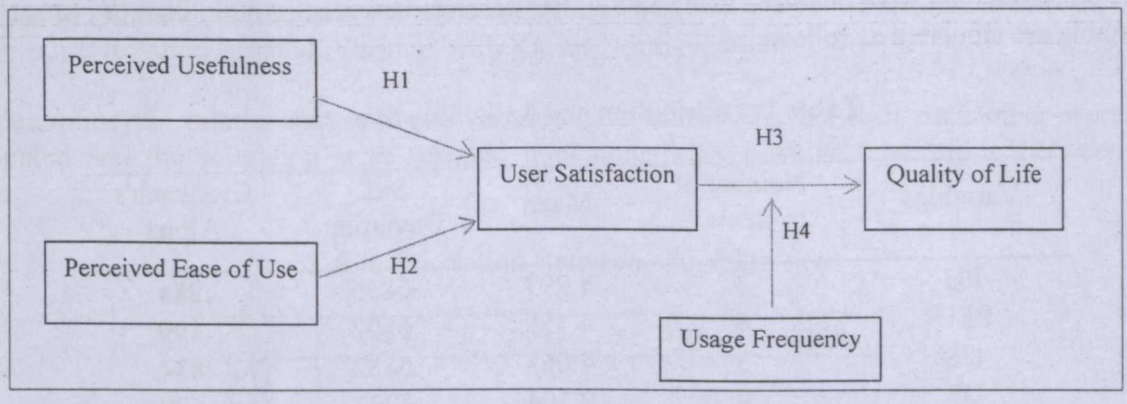
Hosein et al. (2010) ascertained that higher frequency of use of learning technology increased competency in using specific technology. Their notion is inspired by Emmanouilides & Hammond (2000) who found that the longer someone has used the Internet; the more likely they are to be heavy user. Hence, frequent use of ICT may suggest that individuals can easily transfer their repertoire of digital media skill to gain understanding and competency in learning technologies (Nicholson et al., 2005). Usage frequency is the user interaction of using ICT in daily operation measured by the number of times using the Internet per week categorised as Light (use the Internet less than 16 times weekly), Moderate (16 to 30 times weekly), and Heavy (more than 31 times weekly). It is suggested that the longer someone is using the Internet, the more likely one tends to be a heavy user. Hence it is suggested that

H4: The frequency (UF) of ICT usage has a moderating effect between User Satisfaction (US) and Quality of Life among rural communities.

Research Framework

This paper useTechnology Acceptance Model (TAM) to describe the relationship between PU and PEU which are hypothesized to influence User Satisfaction that acts as a mediating variable towards QoL and moderated by Usage Frequency as depicted in Figure 1.

Figure 1: Research Framework



THE METHODOLOGY

In order to meet the above objectives, the study is conducted quantitatively using questionnaire survey to gather numerical data to test the above research framework. Non-probability sampling method was used where rural communities who were involved with ICT program facilitated by the Malaysian Communication and Multimedia Commission (MCMC) at a tele-centre in Banting, Selangor were the targeted respondents. Rural communities are characterized by poverty, low literacy level, inaccessibility to social services, and subsistence farming as a main source of income (Ashley & Maxwell, 2001). These provide the basis upon which individuals in these communities define their needs in the relation to QoL (Narayan et al., 2000). Therefore, they are vital characteristic that command a need-based, people-

centered approach to ICT initiatives for improving rural QoL. The self-administered questionnaire survey was designed using the 5-point Likert scale to measure Perceived Usefulness, Perceived Ease of Use, User Satisfaction, Usage Frequency and Quality of Life.

THE FINDINGS

A total of 247 respondents participated in the self-administered questionnaire where only 224 responses were used to test the hypothesized relationships. There was more female respondents (51.8%) compared to the male respondents (48.2%) with the majority of respondents between 25-44 years of age (49.1%), followed by 19-24 years (33.0%) and the remaining are over 65, showing that young people are the more active Internet users (Das & Sahoo, 2011; Wilson et al., 2012). In terms of ethnicity, 73.2% are Malay, 15.6% are Chinese and the remaining 5.8% and 5.4% are others and Indian respectively. This is similar with the Malaysian rural ethnic population distribution as reported in the Population and Housing Census of Malaysia 2010. It is found that 51.8% of respondents are single with the majority of respondent being high schools leavers (59.8%) since those with better education attainment are commonly expected to go for better opportunities in the urban areas. With regard to employment, 32.1% are students, 21.0% worked in the private sector, and 27.2% are self-employed, thus, indicating high portion of respondents having monthly income of less than RM1500 (60.3%) and only 21.9% earning between RM1501 to RM3000. For the duration of ICT usage, it is found that 46.4% of respondents were using ICT for more than 6 years, 30.4% has been using ICT for 3-5 years and the remaining 23% less than 2 years. Majority of the respondents claimed to use ICT weekly between 1-15 times (38.4 %) for light users, followed by heavy user of 31 times and more weekly (36.2%) and 25.4% are moderate users (16-30 times weekly).

The collected data were analysed using SPSS. The descriptive statistics and reliability of each variable are tabulated as follows:

Table 1: Distribution and Reliability Statistics

Variables	Number of Items	Mean	Std. Deviation	Cronbach's Alpha
PU	3	4.297	.6856	.884
PEU	4	4.155	.6507	.899
US	3	4.068	.6882	.834
UF	2	2.104	.7237	.699
QoL	3	3.886	.5093	.898

Perceive Usefulness (PU) has the highest mean with 4.297 followed by perceived ease of use (PEU) with mean 4.155 and mediating variable user satisfaction (US) at 4.068 indicating that the majority of the respondents perceived high usefulness and ease of ICT facility provided to them. They indicated a fairly high QoLwith a mean of 3.886.

To measure the internal consistency of scales, Cronbach's alpha values were computed and the result in Table 1 indicating that almost all variables exceed the threshold of 0.7 (Hair et al., 2006) with an exception of usage frequency (UF) having a score of 0.699, that can still be

considered acceptable (Sekaran 2006). Hence, all scales to measure the variables used in this study are deemed reliable.

Factor Analysis

Factor analysis, a data reducing technique was performed on the data to validate the scales for each variable (Kline, 2010). A total of 10 items from 2 independent variables and 1 mediating variable were first subjected to a principal axis factoring analysis. The Bartlett's Test of Sphericity indicated that the data were suitable for EFA having KMO of 0.866 surpassing the value of 0.8. The following were resulted where each item used to measure its corresponding variable were found to load to a single factor with loadings higher than 0.6.

Table 2: Rotated Component Matrix for 3 Variables

	Component		
Items	**PE**	**PU**	**US**
Easily Become Familiar	.842		
Clear & Understandable	.814		
Learn Easily	.787		
Easy to Use	.773		
Task Easier		.878	
Task Faster		.856	
Effectiveness		.742	
Satisfactory Services			.892
Satisfied with ICT			.848
Using ICT Correct Decision			.657

Note : 1. Extraction Method : Principle Axis Factoring
2. Rotation Method :Varimax with Kaiser Normalization

To determine the relationship between variables, the correlation between each other were computed and the following were resulted indicating fairly positive relationship between them.

Table 3: Relation Between Variables

	PU	PEU	US	QOL
PU	1			
PEU	.617	1		
US	.531	.555	1	
QOL	.409	.345	.422	1

Note : Correlation is significant at the 0.01 level (2 tailed)

Multiple regressions, a function of independent variables to a dependent variable in quantitative setting was employed to verify the hypothesized relationships. Model I examined the relationship between Perceived Usefulness (PU), Perceived Ease of Use (PEU) as independent variables and User Satisfaction (US) as the dependent variable. As indicated in Table 4, the R-Squared values indicating that 36.6% of variation in User Satisfaction (US) can be explained by Perceived Ease of Use (PEU) and Perceived Usefulness (PU).

Table 4: Model 1 Summary of Impact of ICT on User Satisfaction

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.605[a]	**.366**	.360	.55059

	Unstdz. Coef.		Stdz. Coef		
Model 1	B	Std. Error	Beta	t	Sig.
(Constant)	1.141	.262		4.354	.000
PU	.305	.068	**.304 (H1)**	4.468	**.000**
PEU	.389	.072	**.368 (H2)**	5.397	**.000**

Note : a. Predictors: (Constant), PEU, PU
b. Dependent Variable: US

The Standardized Beta Coefficient to compare the effect of independent variables on the dependent variable observing that both PU and PUE have significant effect on User Satisfaction (p=0.000) with coefficient of 0.304 and 0.368 respectively, indicating that PEU has a slight stronger effect than PU on US. This result validates the first two hypotheses

In the next step to test for the moderation, the Multiple Regression Model II indicated that 21.6% variations in the Quality of Life is explained by its independent variables. The result significantly showed that User Satisfaction (US) has significant effect on QoL ($p<0.05$) with coefficient value of 0.269 and significantly mediating the relationship between the PU and PEU on QoL.

Table 5: Coefficients For Model II

		Unstdz. Coef.		Stdz. Coef		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.389	.220		10.843	.000
	PU	.235	.057	.317	4.096	.000
	PEU	.117	.061	.149	1.928	.055
2	(Constant)	2.162	.224		9.671	.000
	PU	.175	.058	.235	2.989	.003
	PEU	.039	.063	.050	.629	.530
	US	**.199**	.055	**.269**	3.609	.000

Note : a. Predictors: (Constant), PEU, PU
b. Predictors: (Constant), PEU, PU, US
c. Dependent Variable: QOL

Lastly, the test on User Frequency as a moderator was performed and resulted in the following statistical computation which indicates the interaction between User Satisfaction and Usage Frequency to enhance the relationship between User Satisfaction and Quality of Life was somehow insignificant ($p>0.05$).

Table 6: Coefficients for Moderating Variable

	Model	Unstdz. Coef. B	Unstdz. Coef. Std. Error	Stdz. Coef	t	Sig.
1	(Constant)	3.886	.031		125.428	.000
	US	.321	.047	.433	6.880	.000
	FREQ	-.032	.043	-.046	-.744	.457
	US x FREQ	-.051	.065	-.050	-.784	**.434**

Note : .Dependent Variable : QoL

CONCLUSION AND DISCUSSION

This study was conducted to understand the impact of ICT towards quality of life for rural communities. Perceived Ease of Use and Perceived Usefulness were used to measure ICT usage adoption that effect on User Satisfaction and Quality of Life. Usage frequency was included to understand its effect on the quality of life. The finding showed positive relationship between ICT usage (through perceived usefulness and perceived ease of use) and user satisfaction. User satisfaction was found to influence quality of rural life. However, usage frequency was not found to enhance the impact of user satisfaction on quality of life. This implies that rural communities are still able to receive satisfaction while performing their activities through ICT that contribute to their quality of life.

Perceived Usefulness (PU) and Perceived Ease of Use (PEU) having positive relationship with user satisfaction on using ICT explains the level of ICT penetration and usage satisfaction that determined the overall impact on quality of life which is parallel with Kivunike et al., (2008). Therefore, the accessibility to ICT facilities must become a major concern for the Malaysian government to equip rural communities to tap the current technologies. The effect of user satisfaction (US) on quality of life indicates that ICT skills level can determine the nature and extent of ICT utilization. Lack of ICT skills in rural areas in Ghana was accounted for under utilization of ICT, hence limiting its benefits to the farmers (Alemna & Sam, 2006). Therefore, the Malaysian government must educate rural societies and develop long term plans for them to learn and master ICT skills in order to adapt with the ICT development.

ICT becomes as proxy to facilitate the quality of life because it contributes to the easiness and usefulness to perform task either for the business or individual users as generally agreed that ICT leads to development (Heeks, 2010). As noted by Schalock (2004) one of the scientific innovations towards quality of life is having knowledge driven society which possess ICT access and dissemination. Based on the findings, rural communities in Malaysia are well exposed with the importance of ICT and majority of them realized the importance of ICT needs in their daily activities regardless of their age. (Genus & Nor 2007)

The report by Malaysia Census 2010 on the gap for digital divide between rural and urban area at 26.1 percent can be considered not critical as Malaysia is above the world benchmark for Internet user per 100 people. The claim of Silva and Figueroa, (2002) that people in rural communities in developing countries do not realized the ICT benefit is not applicable in Malaysia. The findings of this study matched Kivunike et al (2011) that ICT has on certain occasion is irrelevant to the social, economic and cultural needs of the rural communities or intended beneficiaries. Hence, the government of developing and developed countries

initiatives and effort on ICT development has given strong focus on bridging digital divide by increasing availability and access to ICT for communities to improve their quality of life, was proven effective.

This study indirectly shows that serious effort by the Malaysian government in implementing ICT policy framework is vital for the effective utilization of ICT. As a matter of fact, the setting up of MSC project launched in 1996 forms a base for ICT infrastructure and greatly opened opportunities for economy in this country i.e the emergence of Telco companies, infrastructure and software development companies, IT services and so on, creating huge job opportunities.

Hence, we conclude that the findings in this study may serve as evidence that the Malaysia Government ICT initiatives and investments to drive Malaysia to become an e-knowledge society has improved the quality of life for rural and urban communities since having knowledge society is noted as one of the criteria to gain QoL. Thus, knowledge becomes the fundamental resource for all economic and developmental activities in a society (Nath, 2001). This knowledge provides valuable information for policy makers to consider ICT as part of the government agenda to prepare Malaysia to achieve Vision 2020 and prepare Malaysia to become a high income nation and maintain its stability. The Multimedia Super Corridor (MSC) project developed in 1996 can be considered fruitful. It is strongly suggested that the government to continually support the ICT development effort especially for the marginalized communities.

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